THE NABU NETWORK MODEM

USER'S GUIDE

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INTRODUCTION

Welcome fellow nostalgia nerd! As the interest in old school computing is gaining some more traction, the NABU PC – or NPC – got put into focus with an appearance on various YouTube channels. This is where I – Atkelar – a curious tinkering and coffee addicted cartoon cat came across it for the first time too. The internet immediately got cracking and hacking with the new old stock devices that were put up on e-bay for sale. It is not every day after all that we can find a "new" 8-bit microcomputer.

What makes the NABU computer special compared to others of the time period is that it is purely network based approach. It was supposed to connect to a modem – the Adapter – to fetch data from a cable TV network. The Adapter was responsible to pick the data for the current subscriber off the cable network where it was constantly repeated. The user guide calls this a "wheel".

I chose to start my own attempts at creating a modem replacement that would allow a more direct approach and interaction with a network based server system. Since I also do programming as my day time job, I elected to use my best known modern programming environment for the server side code and go back to the roots for the modem: minimalist hardware and C based code for the micro controller in that device, and assembly language for any program that should run on the NABU.

To round off the effort, I started the user guide in the style of the original NPC guide booklet that was included with the NABU. Just because!

GETTING STARTED

I'm assuming that the modem is ready to go at this point; if you built it yourself, that includes flashing the initial firmware! This section is intended for "user reference".

The modem has several elements on it: The connector labelled "Nabu PC" needs to be connected to the NPC computer. A regular 5-pin DIN cable – like it is commonly available as "MIDI" cable – will work just fine, if it isn't too long. Ideally there would be two lines of twisted pair running between the plugs. If you get any old DIN cable, be sure that every pin is connected to the exact same opposing pin, i.e. 1→1, 2→2 and so on; there is no crossover in the cable!

For a power supply, a decent USB adapter with a USB-C plug should do. The USB power input is set up as a power only socket, so no data device is required. It does report as a powered device however, so it should work well on any USB-C PD[1] source.

When the modem is connected to power, it will "boot". During the boot sequence, there will be some of the activity lights flashing.

The green light indicates **IO**[2] activity. That implies either the internal configuration memory or the SD card.

The yellow light indicates **NET**work activity. This lights up every time some data is transferred between the network, or, the WiFi connection is getting established.

The red light indicates an **ERR**or condition. It will light up or flash when something goes wrong inside the modem program. For an unconfigured modem, it is expected to indicate that condition, so don't let a few blinks throw you off for now, continue to the " Configuring the modem". See the "When something goes wrong" section later if there is nothing happening or there is more than just a simple blink code.

CONFIGURING THE MODEM

When the current configuration fails – which should be the case during the first startup – the modem goes into "servicing mode". This will bring up the modem configuration program automatically when the Nabu PC boots. If you want to change any setting when all seems well, you can force a boot into the servicing mode too. See Forcing servicing

1   USB-C Power Delivery
2   Input/Output

mode chapter.

TODO: Screenshot (and software)

LAUNCHING THE MODEM CONFIGURATION

FORCING SERVICING MODE

As mentioned in the Configuring the modem section, the modem will start servicing mode initially when nothing is configured. But there might be times when you want to force it into servicing mode too. Examples are: changing the network settings, enabling or disabling server settings or connecting to a different remote server.

To make the modem a bit more secure with regards to internet connectivity, changes to the network settings are only available when the modem is running in "servicing" mode. This will deny any regular application access to the configured network (WiFi and Remote server) settings. Only status info will be available via specific requests.

The modem will boot into servicing mode when the "signal" button is pressed during the boot sequence of the modem. So either power cycle or reset it while the "signal" button is pressed. The modem will confirm that intent by flashing the "ERR" and "NET" LEDs in an alternating pattern. If the "signal" button is not released within five seconds, the modem assumes a "stuck button" and continues normally.

In servicing mode, there will be no "channel code" prompt, as the only allowed program is the one stored inside the modem. Thus, as soon as the modem is in servicing mode, you can boot or reset the Nabu PC and will gain access to the configuration program.

UPDATING CONFIGURATION PROGRAM

The configuration program for the modem is stored inside the EEPROM of the modem. That means that you don't need any connectivity or media attached to run this program on your Nabu. Like all software however, it might need occasional updates to fix problems or improve some aspect of the modem. To do this, a supported SD card is needed.

Step 1 – prepare SD card

Copy the new version of the configuration program to the card's root directory with a name of "nabuboot.img". The original file might contain a version number, but the modem only looks for this exact filename! It doesn't matter what OS you use to copy/rename the file, as long as the card is formatted as FAT ("MS-DOS") and the name is proper. When in doubt: This file must be between approximately 200 and 32000 bytes to make sense; which is checked by the modem during update too.

Step 2 – prepare update

Insert the SD card into the modem's SD slot. The following button sequence is timed, so be sure to read first, wrangle the buttons then!

Step 3 – upgrade!

While keeping the "signal" button pressed, reset the modem. You can either use the reset button or power up the modem, that doesn't make a difference. Just make sure the "signal" button is pressed during boot up. If correctly detected, the modem will flash the "ERR" and "NET" LEDs in an alternating pattern. You have to release the "signal" button during this phase, which has a 5-second timeout to detect a "stuck button".

This will bring the modem into the "servicing" mode, as described earlier. It will then scan the SD card for the update file and – if found and properly sized – flash the "ERR" and "NET" LEDs again, this time in sync with each other. During this phase, press the "signal" button again to confirm the update. The confirm phase has again a five second timeout. If you get here without the intent to update the image, just wait until the flashing stops.

Step 4 – Wait for the update to complete

As soon as the confirm button press is released, the modem will pull the image file form the SD card and put it into the internal storage space. Note that the "IO" LED will flash during this operation. Once the update is completed and a bit more validation is done on the new image, the new image will be set as "current" image. This way, an interrupted update or a broken file would still keep the previous image intact, so it's unlikely to "brick" the modem this way. Though the checks are minimal, so… if you TRY to brick it, you will succeed!

When the update is done, the modem will be booted into the "servicing mode". You can use a regular reset or power cycle to get to normal mode again.

WHEN SOMETHING GOES WRONG

Well... bummer. Let's try some basic troubleshooting steps first:

Are all the plugs properly connected?

The DIN plugs need to be connected on both ends, of course and the USB power adapter should work either way around, but some cables or adapters elect to only work in one way around too, to give us the "classic" USB experience, even with USB-C, so worth trying to flip that one over...

Is there a blink code?

If there is none of the lights blinking during power up, the software in the modem might be stuck/broken. It might need reprogramming at a low level. If there are blink codes, use the following table to determine the cause of the problem. Note that the error LED will blink a number of short pulses, then a slightly longer pause, and then repeat the same pattern again. The number of blinks between longer pauses indicates the type of error.

# Blinks	Meaning
2	**Local server failed** – the SD card contains a local server, and a local server was requested in the configuration, but the files didn't add up for some reason. Remove the SD card, check the server directory and try booting the modem with it again.
3	**WiFi server failed** – the connection to the network, either WiFi or the connection to the configured remote server failed. This could also indicate a permission problem. Check the network settings in the modem configuration program.
4	**No server** – The modem couldn't connect to either a local or a remote server and will start in forced configuration mode.